Syllabus

Course Information

This course provides a hands-on introduction to using data to rigorously answer research questions. Students practice cleaning and manipulating data, creating data visualizations, and conducting introductory level statistical analysis using real-world data sets that are relevant to their field. Analysis topics include single and two-sample inference, analysis of variance, multiple regression, analysis of co-variance, experimental design, repeated measures, nonparametric procedures, and categorical data analysis. Reproducible research is strongly emphasized through the use of statistical computing software (e.g. SPSS, Stata, SAS, R, Python). Recommended for all majors that use data for research. 3 hours discussion.

Instructor

- **Name & pronouns:** Dr. Robin Donatello (Dr. D, she/her)
- **Website:** https://www.norcalbiostat.com/
- **Office Location:** Holt 202
- **E-mail:** rdonatello@csuchico.edu
- **Best Contact Method:** Discord
- **Student Office Hours:** TBD

Meeting Logistics

- **Meeting Pattern:** MW 4-5:15, Holt 155
- **Prerequisites:** Basic computer literacy. Recent statistics course such as Math 105, MATH 315, or MATH 350.
- **Mode of Instruction:** In Person.

Required materials and accounts

Homework 0 provides a checklist for you to make sure you have everything.

- **Class website**: https://norcalbiostat.github.io/MATH615/
- **Textbook (Required)**: *Practical Multivariate Analysis (PMA6), 6th ed* by Afifi, May, Donatello, Clark. [Link] There are several available in the library and I have two I can check out for the semester.
- **Textbook (Required)**: Introduction to Modern Statistics (IMS). Free e-book/pdf at https://openintro-ims.netlify.app
- **Laptop & Internet**: Expect to bring your laptop to class every day. Contact me if this poses a problem or concern for you. Refer to ITSS for help with internet.
- **Data Analysis software**: R and R Studio
- **Canvas**: Assignmnent submission, gradebook, class schedule/calendar
- **Google Drive**: Quizzes and collaborative work.
- **Discord**: A free discussion platform with a lot of collaborative functionality. The defacto method of communication for the class.

What are we going to learn? (Course Learning Outcomes)

By the end of the course, students will be able to...

- Import data into a statistical analysis software program in a format that is ready to analyze.
- Process, screen, recode, transform, and clean data.
- Describe distributions and patterns of data using visualizations and words.
- Select and carry out an appropriate statistical analysis.
- Explain study results and limitations to a non-technical audience.
- Understand and implement a reproducible research pipeline.
- Become a data nerd (Optional, but recommended).

Schedule of Topics

The general ordering of topics is:

- Data Collection and recording
- Preparing data for analysis
- Data Visualization

- Foundations for Inference: probability distributions, point and interval estimation, Hypothesis Testing
- Inference comparing multiple samples (t-tests, ANOVA, χ^2 tests)
- Study design, confounding, causation
- Linear regression analysis (Simple and Multiple, Categorical predictors, variable selection)
- Logistic regression analysis
- Model building techniques and comparing model fit

Pre-requisite statistics Knowledge

This class requires a recent statistics course such as Math 105, Math 315 or Math 350. Sometimes you need a refresher on the content that was covered in those classes (such as how to summarize data, probability, distributions). While we will be going over all the basic visualizations and tests again, it will be fast and the emphasis is on interpretation and proper use in research.

- Chapter 6 in the PMA6 textbook contains an overview on how to select appropriate summary measures, graphs (also in chapter 4), and analysis methods. (we'll go through this chapter)
- The Intro to Modern Statistics book can help with this (this is a free required textbook)
- I also like the OpenIntro Statistics book (also available as a free pdf) chapters 1-4.

Items that you need to know very well are

- types of data (categorical, quantitative, numerical, qualitative)
- appropriate plot types depending on types of data (histogram vs bar chart)
- measures of center (mean, median, mode)
- measures of spread (standard deviation, standard error, IQR, range)

Items that you need to know at least a little about

- rules of basic probability (e.g. is between 0 and 1, disjoint/mutually exclusive)
- the normal distribution: Z-scores (how to calculate, how to interpret) and probability under the curve (one-tail, two tail)

How do you get help with stuff?

- See the help page on the course website.

Coursework and Assignments

What am I graded on?

I care both that you are keeping up with the material, but also that by the end of the term you can conduct your own personalized analysis on a new data set. Here is how I check in on your progress throughout the semester

- **Quizzes** on the current or prior content. Quizzes are a great way to test yourself, enhance recall, and self-assess your comprehension of the subject. Quizzes are administered in Google Forms, and done in two parts.
  - **Individual**: First try to answer as many questions without looking at your notes. Then use your notes to answer the rest.
  - **Group**: After the individual quiz closes I will choose 1-4 questions that scored the lowest. We will do a class-wide discussion of those topics, then you will work in groups to redo the selected questions for half credit.
- **Assignments** This is your testing ground, your first round of practice. Can you take what you learned and apply it to a data set. Graded on completeness and effort.
- **Peer reviews** Helping others enhances your own understanding.
- **Project** Can you weave together data and story to do research? This is your second round of practice. Your work should be more polished than in your homework, and I will be grading them in more detail and using a rubric.
- **Comprehensive Final Exam** Can you identify and apply correct statistical theory to new situations?

Okay, but what about the points?

- The gradebook in Canvas contains columns for all graded materials with point values and rubrics.
- The project uses a *mastery based* grading system that allows you to continue to revise your work until it reaches an acceptable level of quality. The details are described on the Project page.
- See here for info on grading peer reviews.

Your final grade will be displayed as a running total in Canvas. The grades are weighted by category as follows:

- Assignments: 25%
- Quizzes: 25%
- Peer Reviews: 5%

- Comprehensive Exam: 15%
- Project: 30%

I use a standard grade cutoff of 100-90%: A, 89-80%: B, 79-70%: C.

Late work

I don't penalize for late work, but I prioritize on time submissions. If you submit an assignment after I'm done grading everyone elses, and we're moving on to the next topic then your assignment may have to wait a week before I can get back to it. That is likely to negatively impact your ability to move forward and to get feedback in time.

There are exceptions for when your work is peer reviewed. There is no grace period for peer reviews. You must be responsible and timely for your colleagues.

Class Policies and statements

Everyone is welcome here

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion,

and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

I would like to create a learning environment that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) To help accomplish this:

- Let me know if you have a name and/or set of pronouns that differ from those that appear in your official Chico records. I make it a point to call on people by name, so please make sure that I know what you want to be called. - I also want to try to pronounce your name as accurately as possible. The more you help and correct me the better I can do to honor your name.
- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. Remember that you can also submit anonymous feedback using the feedback button on the schedule and help pages of the website (which will lead to me making a general announcement to the class, if necessary to address your concerns).
- If you prefer to speak with someone outside of the course, the Office of Diversity and Inclusion is here to assist. Their number is 530-898-4764, and email diversityoffice@csuchico.edu
- I (like many people) am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it. (Again, anonymous feedback is always an option).

Adapted from Monica Linden at Brown University.

Furthermore, I would like to acknowledge that Chico State stands on lands that were originally occupied by the first people of this area, the Mechoopda. I recognize their distinctive spiritual relationship with this land and the waters that run through campus. I am humbled that our campus resides upon sacred lands that once sustained the Mechoopda people for centuries.

Attendance

Class attendance is expected. Talk to me ahead of time if you need to miss a class for a planned reason. In the event of an unplanned reason, PM me in Discord when you can so that I know you are still alive.

This is a graduate class and you all are adults with lives outside this class. Things happen. Each class session will be live streamed, with the recording posted to Canvas within a few days. Common reasons to join the class virtually: - you're sick - you're out of town

Don't expect as good of quality of presentation, and this is not a long term solution/resource. Don't abuse this resource.

Academic Integrity

Students are expected to be familiar with the University's Policy on Student Academic Integrityhttps://www.csuchico.edu/pres/_assets/documents/em-25-015.pdf. Specific sections of this policy are highlighted below as they pertain to this class. Refer to the linked document for definitions.

As an instructor I recognize there are a variety of AI programs available to assist in creating text and writing code. However, I want to stress that, AI programs are not a replacement for human creativity, originality, and critical thinking. Writing (text and code) is a skill that you must nurture over time in order to develop your own individual voice, style, and view.

The use of chat GPT is allowed/encouraged **to help you learn how to code** but all code used must be fully explained in text. We will cover what this means and how to do this when we start data management around week 3. How ChatGPT can help you write code

You are responsible for fact checking the accuracy of statements composed by AI language models. These models are known to produce bullshit responses. And yes, this is a technical term.

- **AI and ChatGPT Usage:** AI writing or coding tools are not permitted for any stage or phase of work in this class. Using AI to help debug, or suggest coding approaches is a useful tool for any coder - but only once you have a solid foundation.
- **Collaboration**: You are *highly encouraged* to work together with a classmate to learn the materials in this class. However your work must be 100% a product of your personal effort. Coding styles are similar to writing styles, each person will have their own unique voice and style.
- **Plagiarism and Self-Plagiarism**: Plagiarism from the course notes and from your prior work are *highly encouraged*. Don't try to start from scratch each time. If you've done something before and need it again - find it and copy/paste/adjust. The biggest benefit to programming in a language such as R is to automate repetitive tasks, and ensure your work is reproducible. Self-plagiarism is a hallmark of a good programmer.

> **!** Be up front!
>
> When presenting text written by Artificial intelligence (AI) language models, such as ChatGPT, you must include an appropriate citation. https://apastyle.apa.org/blog/how-to-cite-chatgpt
> This also goes for when you have it write code for you. You need to indicate when and where you used it.

Not allowed

- Working with or getting help from others on exams and individual quizzes
- Copying code from another student's homework and presenting it as your own work.
- Copy/paste from AI tools or internet sources without customization, citation or explanation
- Getting your sibling/friend/colleague to write code for you
- Submitting any assignment that is not your own personal effort.

Allowed

- Helping each other solve homework problems (concepts or code)
- Use AI to help explain a concept
- Use AI to generate starter code that you modify for your own example.
- Use AI to write code that you cite/disclose and you explain in *your words* what it is doing in details.
- Copy/paste code from my course notes (this is actually encouraged!)

If at any time I suspect that the work you are submitting is not reflective of your personal knowledge I may ask you to verbally explain a piece of code to me. If your explanation is insufficient may result in a 0 on that assignment.

Any use outside of this permission constitutes a violation of Chico State's Integrity Policy and may result in you being reported to the Office of Students Rights and Responsibilities.

Your own commitment to learning, as evidenced by your enrollment at California State University, Chico, and the University's Academic Integrity Policy requires you to be honest in all your academic course work. If you act against these policies your actions will be considered academically dishonest, and a violation of Chico State's Integrity Policy and you may be reported to the Office of Students Rights and Responsibilities.Faculty members are required to report all infractions to the Office of Student Judicial Affairs.

University Policies and Campus Resources

Adding and Dropping the course

This course only runs for a few weeks and all materials are available on the course website. It will be difficult to get caught up if you add the class after the first week. The last day to add or drop classes without special permission by the instructor is 9/6/25. No adds or drops

are allowed after 9/6/25 without a serious and compelling reason approved by the instructor, department chair, and college dean.

IT Support Services

Computer labs for student use are located in the Innovation Lab 2nd floor, and on the first and fourth floor of the Meriam Library, Room 116 and 450,Tehama Hall Room 131, and the Bell Memorial Union (BMU) basement. You can get help using your computer from IT Support Services; contact them through the ITSS web site at http://www.csuchico.edu/itss. Additional labs may be available to students in your department or college.

Americans with Disabilities Act

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

Accessibility Resource Center 530-898-5959 Student Services Center 170 arcdept@csuchico.edu http://www.csuchico.edu/arc

Chico State Basic Needs Project

The **Hungry Wildcat Food Pantry** provides supplemental food, fresh produce, CalFresh application assistance and basic needs referral services for students experiencing food and housing insecurity.

All students are welcomed to visit the Pantry located in the Student Service Center 196. Check the website for a location map and for the most up to date information on open hours: https://www.csuchico.edu/basic-needs/pantry.shtml .

Confidentiality and Mandatory Reporting

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility related to my role as a your instructor. I am required to share information regarding sexual misconduct with the University. Students

may speak to someone confidentially by contacting the Counseling and Wellness Center (898-6345) or Safe Place (898-3030). Information on campus reporting obligations and other Title IX related resources are available here: www.csuchico.edu/title-ix.